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VOL. XXVIII JUNE, 1946 No. 4

JOSEPH R. WATSON

Joseph R. Watson, a founder and charter member of our Society, was born in Berea, Ohio, on August 1, 1874, and died in Gainesville, Florida, June 6, 1946, after a brief illness.

He received his early training in the Berea schools. In 1897 he was granted the B.S. degree from Baldwin College, and the A.M. degree from Western Reserve, 1899. He attended several summer sessions at the University of Chicago between 1903 and 1912. He served as assistant and instructor in biology at Adelbert College of Western Reserve from 1899 to 1901. During 1901 and 1902 he was instructor of botany, physics, and chemistry at Berea College, Kentucky. From Berea he moved to Rochester College, Indiana, where he was head of the department of Science. He taught in the Manitowoc, Wisconsin, High School 1906-1907. The years 1907 to 1911 were spent as professor of biology at the University of New Mexico. In 1911 he came to Florida as head of the Department of Entomology of the Agricultural Experiment Station, and served in that capacity until his death.

Professor Watson's principal interest was in the field of applied entomology as related to Florida agriculture. He did extensive work on the biology and control of the velvet bean caterpillar and the lubberly locust. Many of the insect pests of citrus and vegetable crops received his attention, and he was instrumental in developing more effective methods of combating them. He early recognized the importance of biological control and initiated the introduction of a number of parasites and predators of several crop pests. His work on the control of root knot nematodes won him wide recognition. Some of his recommended control measures are standard practice on Florida farms.

In the field of systematic entomology, he was best known for his work on Thysanoptera. He described some 30 new species of thrips and built up a Department collection of these insects, containing nearly 40 thousand slides. A bibiography of his Thysanoptera papers would contain at least 50 titles. His other entomological writings include several Experiment Station bulletins and numerous papers in journals and magazines devoted to citrus and other crops. Many Florida farmers became acquainted with his work through his appearance on the Florida Farm Hour program of the University of Florida radio station. Making his first broadcast in 1928, he gave an average of at least 30 talks a year for 16 years.

Professor Watson played a prominent part in the founding of our Society in 1916, and he enjoyed a particularly close association with it until the time of his death. He was its first president and he again filled that office in 1921. A year after its organization the Society published the first issue of its official organ, the *Florida Buggist.* After three volumes as the *Buggist,* the name was changed to THE FLORIDA ENTOMOLOGIST. From the first issue to this present number, Professor Watson served as editor, faithfully and willingly, and it was almost wholly due to his efforts and devotion that the journal survived the adversities which so commonly beset scientific publications.

Professor Watson was a profound lover of Nature. At every opportunity he would go to some favored spot in wood or field to observe and enjoy. Usually he would carry a net to capture some passing butterflies or moths while his eyes roved hither and yon, seeking those secrets that Nature would reveal. He was deeply touched by the beauty of tree, or flower, or bird, and he wanted others to share with him the joy and happiness that they created in his heart.

Professor Watson was a fellow of the American Association for the Advancement of Science, a Fellow of the Entomological Society of America, a member of American Ecological Society, Florida State Horticultural Society, Sigma Xi, Phi Kappa Phi, and a member and past president of the Athenaeum Club of the University of Florida.

On August 26, 1902 he married Elizabeth Prout, of Cleveland, who died in 1938. He is survived by three daughters, Miss Wilma Watson of Sarasota, Mrs. Chester Allen of San Mateo, California, and Mrs. Clem Hailey of Orlando, one brother, Charles Watson of Glassboro, New Jersey, one sister, Mrs. Will Indoe of Omaha, Nebraska, and four grandchildren, Priscilla and Susan Allen and Jerry and Patricia Hailey.

Friendly, helpful, and sincere, Professor Watson was respected and admired by hundreds of farmers, entomologists, and others in all parts of the state. With his passing the State and Nation have lost a valuable public servant, and the Florida Entomological Society a staunch and loyal supporter, while his fellow workers and other close friends feel a deep personal loss.—A. N. T.

The
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NEW SPECIES OF FLORIDA MAYFLIES (EPHEMEROPTERA)[1]

LEWIS BERNER

During the period 1937-1941, a rather large series of Florida mayflies was collected in the course of a study of the Ephemeroptera of the state. The descriptions of nine new species discovered during the investigation are presented below; several other forms in the collection probably represent new species, but until the male imagos are obtained and associated with them, the descriptions will be withheld.

Ordinarily, new species of Ephemeroptera are not named when only the nymphal stage is known; however, the nymphs of *Ephemerella* which have been named and described in this paper are sufficiently distinctive to warrant such a radical procedure.

The genus *Choroterpes* has not previously been recorded from the southeast; *Tricorythodes* no closer to Florida than Texas and West Virginia; *Habrophlebiodes* never before from the southeast, other than in the mountainous areas; and *Brachycercus* no nearer than the Louisiana-Texas state line.

I wish to take this means of expressing my thanks to the many friends who have collected specimens for me. Wherever

[1] Contribution from the Department of Biology, University of Florida.

persons other than myself have collected mayflies, their names are noted with the locality record. Professor T. H. Hubbell has consistently given me many valuable suggestions during the course of my work and has kindly criticized this manuscript.

HABROPHLEBIODES Ulmer

Habrophlebiodes brunneipennis n. sp.

Adults of *Habrophlebiodes brunneipennis,* both male and female, can be separated from the closely related *H. betteni* by the amber color of the wings and the strong, dark venation in the former species. Male genitalia are similar in both species. Nymphs differ from other described nymphs in the genus in having spinules on the posterior margins of tergites 6-10. In other species, the spinules occur on tergites 7-10 only.

Description of Holotypic Male Imago (in alcohol):

MEASUREMENTS: Length of body—4.3 mm.; length of fore wings—4.4 mm.; length of caudal filaments—medium 6.3 mm., laterals 5.2 mm.

HEAD: Uniformly brown. Basal antennal segments dark brown, flagellum lighter brown. Upper portion of compound eyes orange-brown, lower part black.

THORAX: Thorax uniformly brown; pronotum outlined in blackish brown. No other distinctive marking.

WINGS: Hyaline, clear amber in color. Long veins of fore wing brown and clearly outlined; cross veins in stigmatic area strongly colored; others much weaker (see figs. 5 and 6).

LEGS: Coxa, trochanter and femur of fore leg deep brown; tibia and tarsus buff; tibia deep brown at proximal and distal ends. Coxa and trochanter of mesothoracic leg paler than those of fore leg; entire leg light tan marked with brown; small band in middle of femur and much broader and heavier band at distal end. Metathoracic femur with broad brown bands at middle and at distal end.

ABDOMEN: Purplish-brown in color. Median pale line on tergites 1-9; small on tergite 1 and obsolescent on tergite 9. Pale line bordered by geminate, dark purplish-brown lines. Segments 2-7 relatively translucent, others opaque. Tergite 1 completely dark except for the small median pale line. Tergites 2-7 extensively pale on anterior margin; a pair of large basal triangles just lateral to geminate lines continuous with a lateral pale area which extends almost to posterior border of segment. Pale areas on tergite 8 much as those on tergites 2-7, but much less extensive. Tergites 9 and 10 almost entirely purplish-brown, except for lighter colored lateral areas on 9 and a pair of anterior median pale spots and a single median pale spot on the posterior margin of tergite 10. Sternites lighter in color than tergites and extensively pale. Sternite 1 entirely dark; 2 with lateral pale triangles. Pale anterior areas on sternites occupy about one-half of each segment. A darker U-shaped mark on 9th sternite; arms of U open

anteriorly. Forceps base, forceps and penes brownish. Genitalia as in fig. 7.

CAUDAL FILAMENTS: White; joints in proximal half of filaments narrowly annulate with brown.

Description of Allotypic Female Imago (in alcohol):

MEASUREMENTS: Length of body—5.2 mm.; length of fore wings—5.7 mm.; length of caudal filaments—median 7.7 mm., laterals 5.3 mm.

HEAD: Light brown, marked with purplish-brown. U-shaped mark on frontal shelf; broad band extends laterally from median ocellus to base of antenna; another broad band extends across head connecting lateral ocelli; posterior portion of head purplish-brown. Antennae purplish-brown.

THORAX: As in male.

WINGS: As in male, except that amber color is not quite so deep. Cross veins stronger than in fore wings of male.

LEGS: Marked as in male, except that tibiae and especially tarsi are darker.

ABDOMEN: Tergites purplish-brown. Very faint median pale line on tergites 1-6; lateral to this on tergites 2-10 a pair of median pale lines extending posteriorly from anterior border; they are longest on tergite 5, where they reach the middle of segment. Pale lines become relatively large on tergite 10. Tergites 1-9 with longitudinal pale stripe on lateral border. Sternites with a median pale line extending from segments 2-7. Large, lateral, pale triangles on 4-7; pair of small pale triangles on anterior borders of 2-7 just lateral to the median line. Immediately posterior to submedian triangles, another pair of pale spots are present. Middle portion of posterior border of sternites 1-7 pale. Sternites 8 and 9 paler than other. Ovipositor almost as long as 8th sternite.

CAUDAL FILAMENTS: Brown tinged; joints narrowly annulate with brown in basal half.

Description of Nymph (in alcohol)

MEASUREMENTS: Length of body—3.8 - 4.9 mm.; length of caudal filaments—median 5.7 - 6.5 mm., laterals 4.8 - 5.9 mm.

HEAD: Uniformly fusco-rufous. Grayish-brown stippling between lateral ocelli.

THORAX: Fusco-rufous. Some irregular grayish-brown stippling on pronotum; lateral and posterior borders of pronotum marked and coloration extending onto the antero-lateral corners of mesonotum. A pair of small grayish-brown spots anterior to mesothoracic wing pads, and a large median spot on posterior border of mesonotum.

LEGS: Femur of fore leg grayish-brown, tibia and tarsus much lighter. Femur of middle leg light brown with small grayish-brown spot in middle and much larger band on distal end; tibia and tarsus unmarked. Hind femur with broad, heavy bands in middle and on distal end; tibia and tarsus unmarked.

ABDOMEN: Fusco-rufous, overlaid with dark stippling. Median dorsal pale line present; some specimens with a pair of pale dashes extending

posteriorly from anterior border of middle segments. Sternites much lighter than tergites.

CAUDAL FILAMENTS: Light brown, unmarked.

Holotype—male imago, in alcohol. Alachua Co., Florida. Small creek 2½ miles west of Gainesville on Fla. Hwy. No. 14 (June 18, 1938). In collection of Museum of Comparative Zoology.

Allotype—female imago, in alcohol. Alachua Co., Florida. Same locality as male (March 5, 1938). In collection of Museum of Comparative Zoology.

Paratypes—63 males, 35 females; 25 males, 20 females in collection of Museum of Comparative Zoology, others in author's collection. Alachua Co., Fla., same locality as for holotype (1 female, March 5, 1938; 6 males, 13 females, June 18, 1938; 2 females, January 7, 1939; 22 males, 2 females, March 10, 1939; 2 males, November 11, 1939; 6 males, March 18, 1940; 7 males, 1 female, March 19, 1940); Devil's Mill Hopper (2 males, 7 females, March 5, 1938); Jackson Co., Fla., 3.6 miles south of Altha on Hwy. No. 6 (11 males, 9 females, June 9, 1938); Leon Co., Fla., 11.2 miles west of Tallahassee on Fla. Hwy. No. 500 (7 males, March 18, 1939).

LOCALITY RECORDS: Alachua Co., Devil's Mill Hopper (April 18, 1933; October 25, 1937, Coll. F. N. Young; March 5, 1938; all nymphs); Worthington Springs (Feb. 5, 1939, Coll. W. M. Beck and A. C. Chable, nymphs); 2½ miles W. Gainesville on Fla. Hwy. No. 14 (Jan. 16, 1938, nymphs and adults; Jan. 29, 1938, nymphs and adults; Feb. 6, 1938, adults; March 5, 1938, nymphs and adults; June 18, 1938, nymphs and adults; Jan. 7, 1939, nymphs and adults; Jan. 28, 1939, nymphs and adults; March 10, 1939, nymphs and adults; November 11, 1939, nymphs and adults; Feb. 5, 1940, nymphs and adults; March 18, 1940, adults; April 17, 1940, adults; Jan. 30, 1941, nymphs and adults); Experiment Station, Univ. of Florida (Jan. 15, 1939, coll. F. N. Young, nymphs). Bay Co., 5.6 miles north of Panama City (Nov. 5, 1938, nymphs; May 30, 1940, nymphs). Columbia Co., Falling Creek (Nov. 13, 1938, nymphs). Hamilton Co., 8.3 miles south of Jasper (Feb. 4, 1938, nymphs). Jackson Co., 2.9 miles north of Altha (July 1, 1939, nymphs and adults); 3.6 miles north of Altha (June 9, 1938, nymphs and adults). Jefferson Co., Drifton (Feb. 5, 1938, nymphs). Leon Co., 11.2 miles west of Tallahassee (March 17, 1939, nymphs and adults); 16.9 miles west of Tallahassee (March 17, 1939, nymphs); 7 miles north of Tallahassee (March 18, 1939, coll. H. H. Hobbs and F. N. Young, nymphs); 13 miles west of Tallahassee (Nov. 30, 1939, nymphs). Liberty Co., Sweetwater Creek (June 10, 1938, nymphs). Santa Rosa Co., 7.1 miles west of Milton (April 4, 1938, coll. H. H. Hobbs and L. J. Marchand, nymphs). Wa-

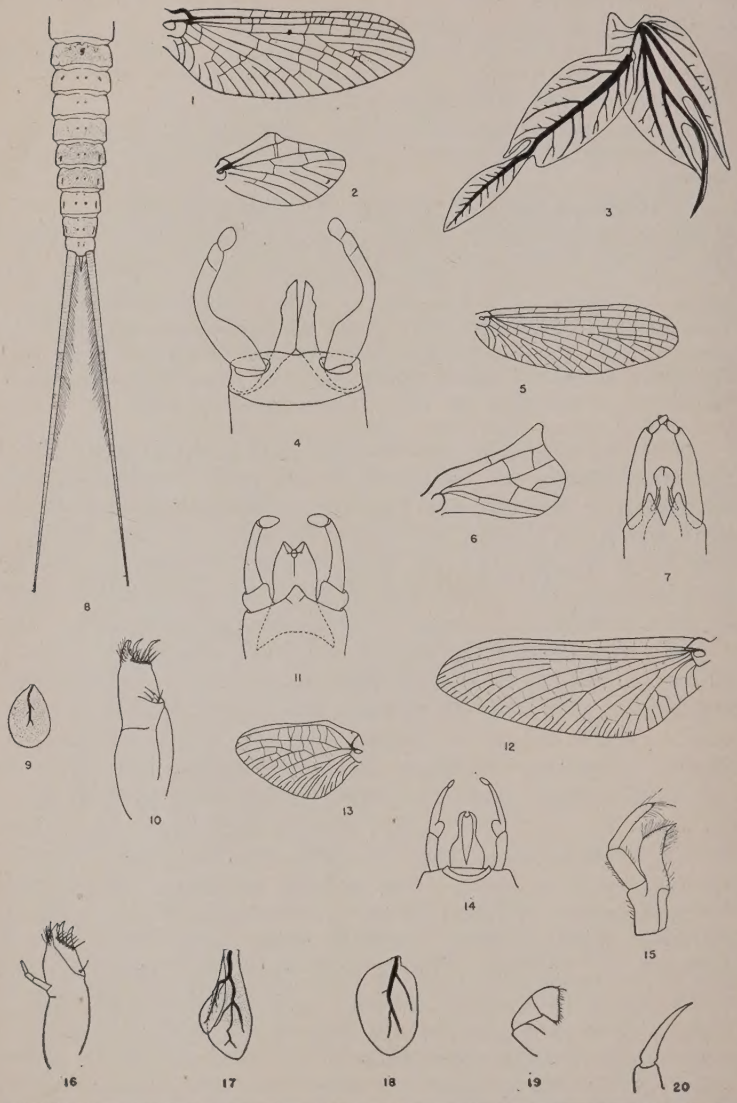

PLATE I

kulla Co., Smith Creek (June 6, 1938, nymphs). Walton Co., 7.3 miles west of Ebro (June 7, 1938, nymphs); 5.4 miles west of Freeport (April 2, 1938, coll. H. H. Hobbs and L. J. Marchand, nymphs); 13.8 miles west of Freeport (June 7, 1938, nymphs); 10.6 miles west of Washington Co. line (May 31, 1940, nymphs). 2.1 miles west of Washington Co. line (May 31, 1940, nymphs).

CHOROTERPES Eaton

Choroterpes hubbelli n. sp.[2]

The adult of *Choroterpes hubbelli* can be distinguished from all other species of the genus by its dark abdomen and pale, unbanded caudal filaments. Characters differentiating the nymphs from those of other species are unknown.

Description of Holotypic Male Imago (in alcohol):

MEASUREMENTS: Length of body—6 mm.; length of fore wings—6 mm.; length of caudal filaments—median 7 mm., laterals 5.5 mm.

HEAD: Brown. Ocelli pale, ringed basally with dark brown. Upper part of compound eyes orange-brown, ringed with narrow brown line; lower part of eyes black. Basal segments of antennae brownish; flagella paler.

[2] I take pleasure in naming this species for Professor T. H. Hubbell, Department of Biology, University of Florida.

PLATE I

Fig. 1. *Choroterpes hubbelli*, fore wing.
Fig. 2. *Choroterpes hubbelli*, hind wing.
Fig. 3. *Choroterpes hubbelli*, 3rd gill.
Fig. 4. *Choroterpes hubbelli*, genitalia of male imago.
Fig. 5. *Habrophlebiodes brunneipennis*, fore wing.
Fig. 6. *Habrophlebiodes brunneipennis*, hind wing.
Fig. 7. *Habrophlebiodes brunneipennis*, genitalia of male imago.
Fig. 8. *Pseudocloeon bimaculatus*, abdomen of nymph.
Fig. 9. *Pseudocloeon bimaculatus*, 7th gill.
Fig. 10. *Ephemerella trilineata*, maxilla of nymph.
Fig. 11. *Ephemerella trilineata*, genitalia of male imago.
Fig. 12. *Ephemerella trilineata*, fore wing.
Fig. 13. *Ephemerella trilineata*, hind wing.
Fig. 14. *Tricorythodes albilineatus*, genitalia of male imago.
Fig. 15. *Brachycercus maculatus*, maxilla of nymph.
Fig. 16. *Ephemerella choctawhatchee*, maxilla of nymph.
Fig. 17. *Centroptilum hobbsi*, 1st gill.
Fig. 18. *Centroptilum hobbsi*, 7th gill.
Fig. 19. *Centroptilum hobbsi*, Labial palp of nymph.
Fig. 20. *Centroptilum hobbsi*, Tarsal claw of 3rd leg of nymph.

THORAX: Nearly uniformly fusco-rufous. Sternum slightly paler than notum. All sutures pale brown.

WINGS: Wings hyaline; stigmatic area of fore wings opaque. Bases of wings brown tinged; in fore wing, tinge extends to humeral brace. Long veins of fore wing brownish basally; brownish tinge of R_1 extends to wing tip. Costal angulation of hind wing prominent. (See figs. 1 and 2).

LEGS: Femora of all legs yellowish-brown; darker brown at base and at knee; brown band at middle of femur. Proximal end of tibiae of all legs narrowly ringed with brown; ring about equal in width to width of tibia. Tibiae and tarsi of all legs pale.

ABDOMEN: Dorsally, grayish-brown; tergites 8-10 darker than others. Prominent, median-dorsal pale line on segments 2-7; reduced to spot on posterior border of tergite 1. Two pairs of pale spots on anterior border of tergites 2-8; another pair of pale spots in middle of tergite lateral to median line on tergites 2-7. Pleural fold dark brown, giving appearance of lateral brown line. Tergites 8-10 unicolorous. Sternites pale except for U-shaped reddish-brown marking on 9th sternite; marking extends onto forceps base. Forceps white; penes brownish (see fig. 4).

CAUDAL FILAMENTS: White, unmarked.

Description of Allotypic Female Imago (in alcohol):

MEASUREMENTS: Length of body—6 mm.; length of wings—6.7 mm.; length of caudal filaments—median 7 mm., laterals 5.5 mm.

Female similar to male, except that the dorsum of the abdomen is unicolorous grayish-brown and there is no U-shaped marking on the 9th sternite.

Description of Nymph (in alcohol):

MEASUREMENTS: Length of body—5-6 mm.; length of caudal filaments—6.5 - 7.5 mm.

HEAD: Brown; sutures pale. Pale areas border anterior margin of median ocellus and lateral margins of lateral ocelli; the latter pale areas continuing to borders of compound eyes. Antennae light brown with grayish tinge.

THORAX: Uniformly brown, except for lateral flanges of pronotum, which are faintly brownish. Sternum light grayish-brown.

LEGS: Light brown, marked with darker brown. Anterior and posterior edges outlined in brown. Femora with large brown spot in middle; knee spot present on all legs. Tibiae with small brown basal marking; median band on all tibiae slightly darker than ground color. Tarsi with median brown band; tips of all tarsal claws brown.

ABDOMEN: Dorsally, uniformly brown with blackish-brown stippling. Pale median dorsal line extends length of abdomen on most specimens, but tends to become obliterated on tergite 10. Venter pale; may have lateral brown stripes in older specimens. Lateral abdominal spines prominent on all segments, becoming progressively stronger from anterior to posterior segments. Gills on segment 1 long, unbranched; gills on segment 3 as shown in fig. 3. Other gills resemble those on segment 3.

CAUDAL FILAMENTS: Light brown, slightly darker at base.

Holotype—male imago, in alcohol. Alachua Co., Florida. Jerome Sink,

2½ miles north of Newberry (March 1, 1940). In collection of Museum of Comparative Zoology.

Allotype—female imago, in alcohol. Same data as holotype (April 22, 1939). In collection of Museum of Comparative Zoology.

Paratypes—6 males, 4 females; 3 males, 3 females in collection of Museum of Comparative Zoology, others in author's collection. Putnam Co., Red-water Lake (1 male, 1 female, March 26, 1939). Alachua Co., Jerome Sink, 2½ miles north of Newberry (2 males, 1 female, April 22, 1939; 2 females, March 1, 1940). Walton Co., 9½ miles west of Portland (3 males, May 31, 1940).

LOCALITY RECORDS: Alachua Co., Jerome Sink, 2½ miles north of Newberry (April 21, 1939, nymphs and adults, coll. F. N. Young; April 22, 1939, nymphs; March 1, 1940, nymphs; March 5, 1946, nymphs); Hatchet Creek (May 6, 1939, imago). Bay Co., 5.6 miles north of Panama City (May 30, 1940, nymphs). Duval Co., 11 miles north of Jacksonville (Aug. 28, 1938, nymphs, coll. H. H. Hobbs). Marion Co., Rainbow Springs (March 9, 1940, nymphs). Putnam Co., Redwater Lake (March 26, 1939, nymphs; October 20, 1940, nymphs). Walton Co., 2.1 miles west of Walton Co. line (May 31, 1940, nymphs); 9.5 miles west of Portland (June 7, 1938, nymphs; May 31, 1940, nymphs and adults).

EPHEMERELLA Walsh

Ephemerella trilineata n. sp.

Adults of *Ephemerella trilineata* may be distinguished from other species of the *bicolor* group by the coloration of the tenth tergite, by the presence of a median, and a pair of submedian, dorsal abdominal stripes, and by the presence of ruddy bands on the distal ends of the femora, as well as reddish markings on the femora. The species is close to *E. doris* and is also related to *E. temporalis*, but differs from the latter by its much paler coloration.

Description of Holotypic Male Imago (in alcohol):

MEASUREMENTS: Length of body—8.4 mm.; length of fore wings—8.7 mm.; length of caudal filaments—11.7 mm.

HEAD: Large, V-shaped, red mark located between lateral ocelli and beginning just behind median ocellus; narrow red line running across head from posterior border of one lateral ocellus to the posterior border of the other and just touching the base of the V-shaped mark. Upper portion of compound eyes dull orange. Basal antennal segment reddish brown; pedicel pale; flagellum reddish-brown basally, becoming pale distally. Large black spot below the antenna at corner of each eye.

THORAX: Pronotum marked with black and reddish-brown; a black spot near lateral margin and another near posterior margin; posterior margin marked with red and black. Mesotum yellowish-brown; a pair of small submedian black dashes on scutellum. Metanotum darker than mesonotum with black marking along margins. A poorly defined brown line extends anteriorly from base of fore wing onto coxa of fore leg. Pro and metasterna blackish, mesosternum light brown.

WINGS: Hyaline; venation colorless. Costal border opaque; stigmatic cross veins anastomosed. (See figs. 12 and 13).

LEGS: Yellowish. A prominent black spot on outer side of each coxa. Each femur with a ruddy band on distal end; in addition, fore femur has a blackish-brown spot just proximal to the band on the outer side of the leg. Tarsal joints with narrow dark lines; claws brownish.

ABDOMEN: Ground color yellowish, markings blackish-brown. Conspicuous median and submedian blackish-brown lines running length of tergites 1-8, becoming fainter on tergite 9, and median line completely absent from tergite 10 and submedian lines extending only half the length of the segment. Tergites 1-4 bordered by black, which is especially heavy on lateral margins of segments 2-4; tergite 9 also bordered laterally with a black line. An oblique black line present laterally on tergites 1-8, and lateral to the oblique line on 1-3 is another longitudinal line. A blackish-brown triangle extends forward from posterio-lateral portion of tergite 8 for about ⅔ of segment. A small ruddy line runs posteriorly from antero-lateral border of tergite 10. A pair of submedian brownish spots present in middle of sternites 1-7, becoming very faint on 7; lateral to these spots on 2-7 are a pair of oblique blackish-brown dashes extending from anterior margin; on sternite 8, the dashes are reduced to spots on the anterior border of the segment; sternite 9 unmarked. Genitalia pale (see fig. 11).

CAUDAL FILAMENTS: Pale, joints beyond basal portion narrowly ringed with brown.

VARIATIONS: Ruddy marking on head obsolescent. Thoracic and abdominal markings may be reddish instead of black and less pronounced. Anterior portion of mesonotum may be dusky or the entire thorax may be overlaid with dusky coloration. Ruddy markings on anterior and posterior borders of femora frequently present; distal end of fore tarsi may be tinged with reddish coloration. Mid-dorsal line sometimes ruddy instead of blackish-brown; line may be obliterated on tergite 5; may extend to posterior margin of tergite 10. Tergites 1-8 may have extensive blackish or reddish shading. Lateral margins of sternites may be strongly outlined in blackish-brown and sternites sometimes tinged with red.

Description of Allotypic Female Imago (in alcohol):

MEASUREMENTS: Length of body—7.7 mm.; length of fore wings—8.4 mm.; length of caudal filaments 8.9 mm.

HEAD: Markings and coloration similar to that of male, but much more extensive, especially blackish-brown marking along occipital border of head.

THORAX: Similar to that of male. Reddish median dorsal line present.

WINGS: As in male.

LEGS: As in male.

ABDOMEN: Pattern similar to that of male. Dark, median-dorsal line almost obscured by reddish line which appears to enclose it; submedian lines much darker at anterior border of each segment, becoming fainter toward posterior border. Median dorsal line continues to the posterior end of tergite 10. Entire dorsum and most of venter with a reddish tinge.

CAUDAL FILAMENTS: As in male.

VARIATIONS: Three dorsal lines on abdomen tending to be obsolescent. All markings may be lighter than in allotype and reddish tinge may be lacking. Ruddy bands on femora sometimes very faint. Median dorsal line of thorax may be black.

Description of Nymph (in alcohol):

The nymph of *E. trilineata* is very similar to that of *E. doris* as described by Traver (1934: 209-211) and illustrated in "The Biology of Mayflies" (1935: plate 38). The color pattern of the nymphs is extremely variable and of little value taxonomically. Structurally, there appear to be no differences between my specimens and those described and illustrated by Traver as *E. doris*. West of the Appalachicola River in northwest Florida, I have taken nymphs which are very similar in appearance to *E. trilineata* nymphs, but the spines on the dorsum of the abdomen are more erect and thinner and the body length is slightly less than that of *E. trilineata* (which is the same as that of *E. doris*); however, I am considering the west Florida nymphs to be *E. trilineata*.

Holotype—male imago, in alcohol. Alachua Co., Florida, Hatchet Creek (April 13, 1939). In collection of Museum of Comparative Zoology. Allotype—female imago, in alcohol. Same data as holotype (April 1, 1939). In collection of Museum of Comparative Zoology.

Paratypes—20 males, 16 females; 12 males, 9 females in collection of Museum of Comparative Zoology, others in author's collection. Alachua Co., Lake Santa Fe (1 female, April 7, 1937; 3 females, Jan. 30, 1940); 2½ miles west of Gainesville on Fla. Hwy. No. 14 (1 male, Feb. 5, 1940); Hatchet Creek (2 females, Feb. 26, 1938; 1 female, April 2, 1938, 1 male, May 5, 1938; 1 male, March 22, 1939; 10 males, 6 females, April 1, 1939; 4 males, 1 female, April 13, 1939; 1 female, May 6, 1939; 1 male, June 24, 1939). Hamilton Co., 0.6 miles north of Live Oak road on Fla. Hwy. No. 2 (1 female, Feb. 4, 1938). Putnam Co., Red-water Lake (2 males, 1 female, March 26, 1939).

LOCALITY RECORDS: *Florida*—Alachua Co., Santa Fe Lake (April 2, 1935, nymphs, coll. A. M. Laessle; April 7, 1937, nymphs and adults; Jan. 30, 1940, nymphs and adults); 1 mile west of Newnan's Lake (May 11, 1937, nymphs; Jan. 8, 1938, nymphs; Jan. 25, 1938, nymphs; Jan. 30, 1940, nymphs and adults); 3 miles north of Paradise (Feb. 12, 1938, nymphs, coll. G. Van Hyning); Worthington Springs (Feb. 5, 1939, nymphs, coll. W. A. Beck and A. C. Chable); Hatchet Creek (March 22, 1937, nymphs; Feb. 8, 1938, nymphs; Feb. 26, 1938, adults; March 23, 1938, adults; April 2, 1938, adults; April 18,

1938, adults; May 5, 1938, adults; Nov. 13, 1938, nymphs; March 5, 1939, nymphs and adults, coll. M. Carr; March 22, 1939, adults; April 1, 1939, nymphs and adults; April 5, 1939, adults; April 13, 1939, nymphs and adults; May 6, 1939, adults; June 24, 1939, adults; Feb. 16, 1940, nymphs and adults); 2½ miles west of Gainesville on Hwy. No. 14 (Feb. 4, 1940, nymphs and adults). Bay Co., Juniper Creek, 28.7 miles north of Panama City (June 8, 1938, nymphs). Columbia Co., Falling Creek (Nov. 13, 1938, nymphs). Escambia Co., Bayou Marquis (June 1, 1940, nymphs). Gadsden Co., River Junction (March 17, 1939, nymphs); 4½ miles south of River Junction (March 17, 1939, nymphs). Hamilton Co., 0.6 miles north of Live Oak Road on Fla. Hwy. No. 2 (Feb. 4, 1938, nymphs and adults). Hillsborough Co., Hurrah Creek at Picnic (March 26, 1938, nymphs). Holmes Co., Sandy Creek (Dec. 11, 1937, nymphs). Jefferson Co., Drifton (Feb. 5, 1938, nymphs). Liberty Co., Hosford (March 17, 1939, nymphs); Little Sweetwater Branch (Dec. 10, 1937, nymphs); Sweetwater Creek (Nov. 4, 1938, nymphs; Dec. 1, 1939, nymphs). Marion Co., Oklawaha River at Eureka (Feb. 12, 1938, nymphs). Okaloosa Co., 5.1 miles west of Walton Co. line on Fla. Hwy. No. 10 (May 31, 1940, nymphs). Putnam Co., Red-water Lake (March 26, 1939, nymphs and adults). Santa Rosa Co., 4.8 miles north of Navarre (June 1, 1940, nymphs). Walton Co., Portland (April 3, 1938, nymphs); 9.5 miles west of Portland (May 31, 1940, nymphs); 2.6 miles west of Freeport (June 7, 1938, nymphs); 13.8 miles west of Freeport (June 7, 1938, nymphs); 15.6 miles west of Freeport (June 7, 1938, nymphs); 10.6 miles west of Washington Co. line on Hwy. No. 10 (May 31, 1940, nymphs). *Alabama*—Baldwin Co., Dyas Creek (June 3, 1940, nymphs). Escambia Co., 4.6 miles east of Wawbeek (June 4, 1940, nymphs). Mobile Co., 3.5 miles south of Irvington (June 2, 1940, nymphs); Bayou La Batre (June 2, 1940, nymphs); 2.1 miles south of Kushla (June 3, 1940, nymphs).

Ephemerella hirsuta n. sp.

This species is known from only two nymphs, one mature and the other immature. It falls clearly into the *simplex* group of the genus *Ephemerella*, and is characterized by the presence of gills on segments 4-7 only; gills on segment 4 semi-operculate; presence of maxillary palps; and the fact that segment 9 is no longer than segment 8. The banding of the legs of *E. hirsuta*

differs from that of *E. attenuata*, the only other species with which it might be confused. The mesonotum and head especially are covered with long coarse hairs.

Description of Holotypic Nymph (in alcohol):

MEASUREMENTS: Length of body—7.5 mm.; length of caudal filaments—3.1 mm.

HEAD: (Mounted on slide in balsam; mouth-parts dissected out) Occipital tubercles prominent, covered with long coarse hairs. Hairs on remainder of head somewhat shorter. Maxillary palp well developed; second segment relatively small.

THORAX: Entire thorax covered dorsally with long, coarse hairs, which are particularly noticeable on mesonotum and wing pads. A pair of submedian tubercles located near posterior margin of prothorax.

LEGS: Blackish-brown spot at juncture of trochanter and femur on all legs. Femora with two brown bands, one located in basal third and the other in distal third; proximal band much lighter in color than distal band, and on femur of prothoracic leg it is very faint. Tibiae of all legs with brown knee spot and brown band in outer half. Tarsi banded with brown in basal half; twelve denticles on each claw.

ABDOMEN: Flattened dorso-ventrally. Distinct dorsal submedian spines present on posterior margins of tergites 4-7. Lateral abdominal spines relatively blunt; lateral margin of 8th segment pronouncedly sinuate, 7 and 9 with just a suggestion of being sinuate. Median dorsal line clearly defined on tergites 6-9. A pair of dark brown spots on segments 1-9 about half-way to lateral margin and just medial to gills on tergites 5-8; produced into long thin lines on tergite 9. Submedian dark lines present on tergite 10. Ventrally, a large dark spot on antero-median border of sternites 3-8; a pair of dark brown spots or dashes present about half-way to lateral margin on sternites 2-9; on anterior margin of sternites 3-8, a pair of submedian oblique dashes and posterior to these, a pair of submedian spots.

CAUDAL FILAMENTS: Pale, unmarked. Basally covered with spines, distally with long, fine hairs.

Holotype—nymph (head, mouthparts, and right legs mounted in balsam; remainder of body preserved in alcohol). Escambia Co., Alabama, Perdido Creek (April 5, 1938, coll. H. H. Hobbs and L. J. Marchand). In collection of Museum of Comparative Zoology.

Paratype—1 nymph, immature. Same data as holotype. In author's collection.

Ephemerella choctawhatchee n. sp.

Although this species is known only in the nymphal stage, it is believed to be sufficiently distinct to warrant specific rank. *Ephermerella choctawhatchee* clearly falls into Traver's *needhami* group of the genus and appears to be most closely related to *E. catawba*, which is known from the mountains of North Carolina. The nymphs of *E. choctawhatchee* can be distinguished by the leg markings in which the tibiae have a pale band

at the apex; tarsi banded in basal third; and by the presence of a pair of small submedian spines on the posterior margins of segments 4-7.

Description of Holotypic Nymph (in alcohol):

MEASUREMENTS: Length of body—6.3 mm.; length of caudal filaments—4 mm.

HEAD: Smooth; mottled with brown. Basal antennal segments brown; extreme base of flagellum brown, remainder pale. Maxilla as in fig. 16.

THORAX: Non-tuberculate. Pronotum mottled with brown; anterolateral angles pale. Mesonotum evenly mottled with brown; a pair of pale, submedian triangles at anterior border; a brown spot at base of wing pad. Sternum lightly mottled with brown.

LEGS: Brown. Femora with some paler mottling, but tibiae uniformly brown. Tarsi brown in basal half, pale distally; tarsal claws with six or seven denticles.

ABDOMEN: Light brown with darker brown markings. Median portion of posterior border of tergites 2-8 slightly indented and on 4-7 the arms produced by the indentation project posteriorly into small spines. Tergites 7-9 reddish brown. Broad, geminate reddish-brown lines running length of dorsum, leaving a pale mid-dorsal stripe. Reddish-brown lateral line on segments 2-10, covered by gills on segments 4-7 and partly covered on 8. Ventrally, abdomen mottled very much like sternum; a brown longitudinal line is present laterally on each abdominal sternite. Gills on segments 3-7, each one partially covering the one behind, all fitting closely to the abdomen between the rounded dorsum and the segmental flanges.

CAUDAL FILAMENTS: Light brown, except for a small brown band in the distal portion of the filaments.

VARIATIONS: Tibiae may have pale band at distal end. Geminate lines may be absent from abdominal tergites, but pale median dorsal line remains. Dark brown areas may be present laterally on tergites 3, 4, 6, 7, and 8. Some specimens with a pair of pale spots on posterior margins of tergites 2-9; large pale areas may be present on tergites 5 and 6 just lateral to pale spots. Four brown spots sometimes present in a row on sternites 2-7 and two spots on sternites 1 and 8. Caudal filaments may have four broad bands in distal half.

Holotype—nymph, in alcohol. Okaloosa Co., Florida, 5.1 miles west of Walton County line at Hwy. No. 10 (May 31, 1940). In collection of Museum of Comparative Zoology.

Paratypes—9 nymphs; 5 in collection of Museum of Comparative Zoology, others in author's collection. Okaloosa Co., 3.6 miles north of Niceville (April 3, 1938, 1 nymph, coll. H. H. Hobbs and L. J. Marchand). Gadsden Co., 4½ miles south of River Juncton (March 17, 1939, 3 nymphs). Liberty Co., 10.3 miles south of River Junction (March 17, 1939, 3 nymphs); Sweetwater Creek. (Dec. 1, 1939, 2 nymphs).

Tricorythodes albilineatus n. sp.

Certain minor color differences separate this species from previously known forms of *Tricorythodes*. This is the first

record of the genus occurring south of West Virginia or east of the Mississippi River in the United States, although it has been recorded from South and Central America. *T. albilineatus* appears to be close to *T. atratus* but the Florida species has more limited dark markings on the abdomen and is characterized by a pale median line on the dorsum of the abdomen.

Description of Holotypic Male Imago (in alcohol):

MEASUREMENTS: Length of body—4.1 mm.; length of fore wings—4.6 mm.; length of caudal filaments—median 17 mm., laterals 11.8 mm.

HEAD: Head pale, shaded with gray. Posterior margin bordered with black; blackish shading around antennal bases. A pair of small tubercles medial to lateral ocelli, near occipital border. Antennae pale, shaded with gray.

THORAX: Mesothorax rather uniformly blackish-brown. Pro- and metanotum lighter in color than mesonotum. Prosternum pale, shaded with gray; metasternum lighter in color than prosternum. Large ganglionic areas of thoracic sternum faintly smoky and outlined in black.

WINGS: Hyaline, whitish. Subcosta and radius with purplish shading which fades out toward wing tip; purple shading extends into costal border.

LEGS: Coxae and trochantera blackish-brown. Femora heavily shaded with purplish-brown, with a strong concentration at distal end forming a dark band on all legs; edges of femora outlined in dark brown. Proximal end of fore tibiae dark, remainder shaded with gray; tibiae of other legs shaded with purplish-brown, tending to form into dark spots in middle of tibiae. Fore tarsi shaded with gray; other tarsi shaded with purplish-brown.

ABDOMEN: Grayish-white, heavily marked with black. 1st tergite almost completely covered with black strippling, except on lateral margins. Lateral borders of all tergite extensively pale; blackish longitudinal line at pleural fold on 2-9, becoming rather strong on 2 and 7. Black, germinate, longitudinal lines present on tergite 2-9, tending to coalesce on the posterior border of 9, and continuing onto 10 as a single dark line. Area between geminate lines forms a pale, whitish, longitudinal line extending length of tergites 2-9. Connected with, and extending laterally from the geminate lines is a less concentrated blackish area on tergites 2-8. The blackish areas are restricted to the posterior portion of the anterior tergites, but gradually suffuse the middle portions of the posterior segments, extending all the way to the anterior border on tergite 8. The dark area also extends laterally on the posterior margin of tergite 7 to connect with the dark line at the pleural fold. Tergites 9 and 10 are darker because of the underlying tissues, and tergite 10 is rather uniformly tinged with black. Sternites same color as tergites, and marked with blackish stippling which tends to form bands on posterior margin of 1-9 and becomes more extensive on posterior segments. A black lateral dash next to pleural fold on all sternites. Sternite 9 brownish in anterior half, blackish posteriorly. A small black median spot present on intersegmental membranes of venter. Forceps base blackish; forceps smoky, penes brownish (see fig. 14).

CAUDAL FILAMENTS: Smoky basally, becoming white distally.

Description of Allotypic Female Imago (in alcohol):

MEASUREMENTS: Length of body—3.9 mm.; length of wings—4.6 mm.; length of caudal filaments—median 4.1 mm., laterals 2.7 mm.

HEAD: Similar to that of male, except occipital border darker.

THORAX: Blackish dorsally; pronotum with a few irregular pale areas laterally. Sternum much lighter than notum. Prosternum stippled with black between coxae; mesosternum less deeply colored, and metasternum still lighter. Ganglionic areas not differentiated as in male.

WINGS: As in male.

LEGS: Fore femur shaded with dark purplish coloration, which is concentrated into an irregular band on distal end; tibia crossed by two bands; tarsus smoky. Mid and hind femora more extensively colored with purplish shading, the color tending to concentrate into a basal and distal band. Mid and hind tibiae black at proximal end, distal half purplish, the two bands thus formed connected by a fine line which continues onto tarsi. Tarsi smoky.

ABDOMEN: Color pattern similar to that of male, except that the dorsum is much more deeply and extensively colored. Lateral margins of tergites pale, and median dorsal white line is clearly defined. Ventrally, dark shading tends to concentrate toward middle of segment.

CAUDAL FILAMENTS: Basally blackish merging into smoky and then becoming white distally.

Description of Nymph (in alcohol):

MEASUREMENTS: Length of body—male nymphs 3.6-3.8 mm., female nymphs 5.2-5.5 mm.; length of caudal filaments—male nymphs 2.4-2.6 mm., female nymphs 3.4-3.9 mm.

HEAD: Extensively mottled with black, which may tend to concentrate near the posterior border in very mature nymphs. Heavy black line extending from posterior margin of compound eye obliquely inward to occiput. Antennae either pale or dusky.

THORAX: Dorsum extensively mottled with black. Lateral borders of pronotum with wide pale areas. Mesonotum with irregular, pale areas anterior to the base of wing pads. Sternum pale; there may be some blackish shading on the prosternum and mesosternum, leaving ganglionic areas pale.

LEGS: Pale; femora dark-banded distally and there may be a concentration of black proximally giving the appearance of an irregular basal band. Tibiae with black basal band and suggestion of dusky median band. Tarsi with light brownish tinge basally, remainder pale; claws pectinate.

ABDOMEN: Color pattern similar to that of adult. Lateral flanges of segments 3, 4, 5, and 7 almost completely black except for the posterior border; posterior half of lateral flange on sixth segment pale. Median-dorsal, white line clearly defined in most specimens but may tend to become obliterated on some. A heavy black transverse line present at posterior border of tergite 2 and just anterior to operculate gill. Elytroid gill black or mottled with black spots, except for narrow hyaline border.

CAUDAL FILAMENTS: Light brown, darker basally. In some specimens filaments may be dark brown.

VARIATIONS: Femora of many male nymphs extensively spotted with black, forming an irregular pattern instead of bands. Tibiae may be considerably darkened in the middle, and tarsal bands clearly defined.

Holotype—male imago, in alcohol. Alachua Co., Florida, Santa Fe River at Poe Springs (March 4, 1939). In collection of Museum of Comparative Zoology.

Allotype—female imago, in alcohol. Same locality as male (Feb. 28, 1939). In collection of Museum of Comparative Zoology.

Paratypes—8 males, 52 females; 4 males, 32 females in collection of Museum of Comparative Zoology, others in author's collection. Alachua Co., Fla. Same data as for holotypes (2 males, incompletely molted, March 4, 1939; 1 male, 52 females, February 28, 1939; 5 males, 3 incompletely molted, February 18, 1939).

LOCALITY RECORDS: Alachua Co., Santa Fe River at Poe Springs (May 14, 1934, nymphs, coll. J. S. Rogers; May 21, 1934, nymphs, coll. J. S. Rogers; March 19, 1935, nymphs, coll. A. M. Laessle; March 24, 1937, nymphs; March 12, 1938, nymphs and adults; March 18, 1938, adults; May 14, 1938, nymphs; Feb. 11, 1939, nymphs and adults; Feb. 18, 1939, nymphs and adults; March 4, 1939, adults; March 25, 1939, nymphs and adults; Oct. 25, 1939, nymphs and adults; April 6, 1940, nymphs and adults). Bay Co., 27.4 miles north St. Andrews (May 30, 1940, nymphs); Pine Log Creek (May 31, 1940, nymphs). Citrus Co., Withlacoochee River (April 2, 1937, nymphs). Gadsden Co., 10 miles south River Junction (July 1, 1939, nymphs). Gilchrist Co., Suwannee River at Fannin Springs (April 5, 1938, nymphs). Hernando Co., County line at south end of county (March 27, 1938, nymphs); Weekiwatchee Springs (August 20, 1938, adults, coll. T. H. Hubbell and J. J. Friauf). Hillsborough Co., Six-Mile Creek (March 26, 1938, nymphs); Hillsborough River (Feb. 11, 1939, nymphs, coll. L. J. Marchand); Jackson Co., Blue Springs Creek near Marianna (June 9, 1938, nymphs). Leon Co., 7 miles south Hwy. No. 19 on Hwy. No. 127 (June 5, 1938, nymphs). Liberty Co., Sweetwater Creek, Torreya State Park (June 10, 1938, nymphs; Nov. 4, 1938, nymphs; July 1, 1939, nymphs). Madison Co., at Jefferson Co. line, Aucilla River (June 4, 1938, nymphs and adults). Marion Co., Silver Springs (May 7, 1934, nymphs, coll. R. R. Shepard); Rainbow Springs (March 9, 1940, nymphs; Feb. 26, 1939, nymphs, coll. L. J. Marchand); Ocklawaha River at Hwy. No. 38 (March 19, 1938, nymphs and adults). Okaloosa Co., 5.1 miles west of Walton Co. line (June 7, 1938, nymphs; May 31, 1940, nymphs). Wakulla Co., Wakulla Springs (May 29, 1940, nymphs and adults). Walton Co., 13.8 miles

west of Freeport (June 7, 1938, nymphs and adults); 9.5 miles west of Portland (May 31, 1940, nymphs); 10.6 miles west of Walton Co. line (May 31, 1940, nymphs). Washington Co., Holmes Creek at Holmes Co. line (July 2, 1939, nymphs).

BRACHYCERCUS Curtis

Brachycercus maculatus n. sp.

In the adult stage, *Brachycercus maculatus* can be distinguished from other known species of the genus only by the use of colorational differences. The nymph can be differentiated both by morphological and color pattern differences. In the adult male (female unknown), tergites 1-6 are prominently mottled; there is a mid-dorsal line present on segments 6-9; the anterior margins of sternites 1-9 are blackish and there are no spots on the sternites. The nymph, known from a single cast skin, lacks prothoracic tubercles, the head tubercles are less prominent than in *B. lacustris,* and the legs are not dark banded.

Description of Holotypic Male Imago (in alcohol):

MEASUREMENTS: Length of body—5.0 mm.; length of wings—4.2 mm.; length of caudal filaments—12.8 mm.

HEAD: Buff colored, marked with blackish-brown. Transverse line present just above median ocellus, another on dorsum of head connecting lateral ocelli; heavy black posterior border of head interrupted at middle; narrow geminate lines on dorsum of head paralleling epicranial suture. Blackish spot just below lateral ocellus. Dark brown spot on outer side of basal antennal segment; remainder of antenna pale.

THORAX: Pronotum mottled with purplish-brown. Mesonotum brown, tinged with purple which is more intense in scutellar area; median line present with two longitudinal lines meeting posteriorly just before the scutellum. Metanotum mottled with purplish-brown. Prosternum shaded with purplish-brown. Mesosternum brown with some purplish shading in anterior half. Metasternum lighter brown with faint purplish-brown transverse line on anterior margin.

WINGS: Semi-hyaline, whitish and lightly shaded with purple. Subcosta and R_1 heavily shaded with purplish-brown except in outer fourth; shading extends well into costal border. All other longitudinal veins in anterior half of wing deeply colored basally, but color tends to disappear apically.

LEGS: Fore coxa shaded with purplish-brown on outer side; trochanter and femur purplish-brown; tibia smoky; tarsus slightly lighter in color than tibia and narrowly ringed with brown at joints. Mid and hind legs light brown with smoky shading; tarsi unbanded.

ABDOMEN: Tergites 1 and 2 heavily shaded with blackish-brown, which tends to be slightly darker in median and posterior parts of segments. Tergites 3-6 almost entirely covered with blackish-brown, but lighter in color than tergites 1 and 2; laterally, these segments predominantly pale, except for narrow blackish line on anterior border; line extends to pleural

fold and then projects posteriorly along lateral border of segments. Posterior margins of tergites 6-9 margined with blackish-brown, which is most pronounced on tergite 8. Tergites 7-9 predominantly pale; broad median dorsal line on 7-9, which is faintly evidenced on tergite 6 as well; 7-9 with heavy black marking on antero-lateral border extending to pleural fold. Tergite 10 slightly darked in color than 9; very narrow median-dorsal line and some brownish marking on posterior margin. Sternum pale; anterior margins of 1-9 blackish, with the shading tending to be darker laterally. Forceps light brown.

CAUDAL FILAMENTS: White, unmarked.

VARIATIONS: Tergites 1 and 2 may be extensively pale with black confined to a median line and the posterior margin. Median dorsal line on abdominal segments may be confined to tergite 7 and anterior half of 8. Pronotum sometimes pale with irregular black areas.

Description of Nymphal Exuviae (in alcohol):

MEASUREMENTS: Length of body—7.4 mm.; caudal filaments missing.

HEAD: Three tubercles on head; one frontal, placed between antennal bases; two others just medial to compound eyes. Tubercles less prominent than those of *B. lacustris*, and somewhat rounded in shape. Maxilla as in fig. 15.

THORAX: No prothoracic tubercles present. No other differentiating characters on the exuviae.

LEGS: Unbanded, except for tibiae in which outer half is slightly lighter in color than basal half.

ABDOMEN: Lateral projections on segments 2-5 strongly upcurved.

Holotype—male imago, in alcohol. Alachua Co., Florida, Santa Fe River at Poe Springs (Feb. 28, 1939). In collection of Museum of Comparative Zoology.

Paratypes—5 male imagos, in alcohol. Same data as holotype. 2 males in collection of Museum of Comparative Zoology, others in author's collection.

Nymphal exuviae in collection of Museum of Comparative Zoology.

CENTROPTILUM Eaton

Centroptilum hobbsi n. sp.[3]

Only the female of *Centroptilum hobbsi* is known in the adult stage. It can be distinguished from the only other known Florida species, *C. viridocularis*, by the absence of extensive reddish areas on abdominal tergites 2-6. The nymphs are easily separated from those of *viridocularis* by means of the gill structure, which in *hobbsi* includes a recurved flap on the 1st abdominal segment only; by the shorter, stouter claws in *hobbsi;* the presence of spines on the lateral margins of abdominal segments 8-10 only; and the unmarked abdominal sternites in *hobbsi*.

[3] I take pleasure in naming this species for Professor H. H. Hobbs, Department of Biology, University of Florida.

Description of Holotypic Female Imago (in alcohol):

MEASUREMENTS: Length of body—5.3 mm.; length of fore wings—4.7 mm.; length of caudal filaments—6.2 mm.

HEAD: Light buff in color; ruddy markings medial to lateral ocelli; small pair of longitudinal red-brown lines medial to compound eyes. Basal antennal segments whitish, flagellum dusky.

THORAX: Pronotum light brown. Mesonotum buff with no distinctive markings. Metanotum slightly darked than mesonotum. Sternum whitish, unmarked.

WINGS: Costal border of fore wings subhyaline, remainder of wings clear. Hind wings long and thin, extending to posterior border of fore wings. Hook of hind wing prominent.

LEGS: Unmarked; slightly paler than mesonotum.

ABDOMEN: Dorsally light brown, becoming paler on tergites 7-10. A pair of reddish-brown stripes extend laterally on posterior borders of all abdominal segments leaving a clear median area on posterior border, which give impression of a median pale line extending length of abdomen. Stripes expecially well defined on tergites 1-4, becoming progressively less prominent posteriorly, until they become very faint on tergite 10. Each stripe extends about half way to lateral border of its respective segment. Venter pale, unmarked.

CAUDAL FILAMENTS: White, unmarked.

Description of Nymph (in alcohol):

MEASUREMENTS: Length of body—4.1-4.8 mm. (male nymphs smaller than female); length of caudal filaments—1.5-1.7 mm.

HEAD: Grayish-brown and without distinctive markings. Distal segment of labial palp dilated, but not quite so much as that of *C. viridocularis* (see fig. 19).

THORAX: Grayish-brown, marked with an irregular pattern which is slightly darker than ground color. Narrow, median, pale line extends length of notum. Sternum pale. Pleurae marked with reddish brown.

LEGS: Buff colored. Femora pale at base, in middle and at distal end; remainder banded with light brown. Tibiae with broad, light-brown band in middle. Tarsi darker at base, pale distally; tarsal claws relatively short and thick (see fig. 20).

ABDOMEN: Dorsally, abdomen brown, except for median and lateral pale areas on anterior borders of segments 2-8; lateral pale areas covered by gills. Posterior median pale area present on tergites 1-7; a pair of reddish-brown stripes lie along posterior border of tergites 1-7, separated by the posterior median pale area; each stripe extends laterally about half way to lateral margin of segment. Posterior border of tergites 8-9 margined with an uninterrupted reddish-brown stripe which extends almost to lateral margin of segments. Venter buff colored, unmarked. Spines on lateral margins of segments 8-10. Gills on 1st abdominal segment with recurved flap, all other gills single (see figs. 17 and 18). Branches of main tracheae of gills predominantly directed medially.

CAUDAL FILAMENTS: Yellowish-white, annulate with brown.

Holotype—female imago, in alcohol. Alachua Co., Florida, Santa Fe River at Poe Springs (March 25, 1939). In collection of Museum of Comparative Zoology.

Paratypes—2 female imagos, in alcohol. Alachua Co. Same data as holotype (Feb. 11, 1939; March 25, 1939). 1 female in collection of Museum of Comparative Zoology, 1 female in author's collection.

LOCALITY RECORDS: Alachua Co., Santa Fe River at Poe Springs (May 21, 1934, nymphs, coll. J. S. Rogers; March 12, 1938, nymphs; May 14, 1938, nymphs; Feb. 11, 1939, nymphs; Feb. 18, 1939, nymphs; March 25, 1939, nymphs). Hillsborough Co., Six-Mile Creek (March 26, 1938, nymphs); Hillsborough River (Oct. 21, 1940, nymphs, coll. L. J. Marchand). Jackson Co., 12.2 miles southeast of Marianna (June 9, 1938, nymphs). Marion Co., Rainbow Springs (March 9, 1940, nymphs).

PSEUDOCLOEON Klapalek

Pseudocloeon bimaculatus n. sp.

Pseudocloeon bimaculatus is known from numerous nymphs, five females, and one male. The male adult may be separated from other species of the genus by its small size and the presence of a pair of small red spots on its abdominal tergites. In many respects, the male resembles *P. veteris* as described by Traver in "The Biology of Mayflies," but differs chiefly in the size of the wings, and its genitalia are more like those of *P. dubium*, as illustrated in Fig. 168 of the above reference. The paired red spots are present on the abdomen of females as well as males. Nymphs may be separated from others of the genus by the fact that the seventh pair of gills is deeply colored with reddish brown and, in addition, the banding of the caudal filaments and the length of the median caudal filament in relation to the width of the laterals are distinctive. The nymphs and very clearly marked and can be identified with the naked eye among other Florida species, since it is the only *Pseudocloeon* found in this region in which the venter of the terminal abdominal segments is deep red-brown.

Description of Holotypic Male Imago (in alcohol):

MEASUREMENTS: Length of body—3.4 mm.; length of wings—3.3 mm.; length of caudal filaments—7.3 mm.

HEAD: Uniformly brown. Turbinate eyes large, almost contiguous basally; separated by a narrow brown line. Antennae brown.

THORAX: Dark brown; no distinctive maculation.

WINGS: Hyaline; stigmatic area whitish. Extreme base of subcosta and R_1 brown, colorless distally; all other veins colorless.

LEGS: Fore legs missing. Coxae and trochantera brown; remainder of legs yellowish white; tarsal claws brownish.

ABDOMEN: Abdominal segments 2-6 semi-hyaline, yellowish-white. A pair of small submedian red spots in center of tergites 3-6; tergite 7 dark brown, 8-10 lighter in color. Sternites 4 and 5 with median reddish marking on posterior border. Sternites of segments 7-9 slightly paler than tergites. Spiracular openings of pale segments marked with black spot, which is continued forward as a dark line. Genitalia very similar to those of *P. dubium* as illustrated in Fig. 168, "The Biology of Mayflies."

CAUDAL FILAMENTS: White, unmarked.

Description of Allotypic Female Imago (in alcohol):

MEASUREMENTS: Length of body—3.9 mm.; length of wings—4.3 mm.; length of caudal filaments—7.0 mm.

HEAD: Light brown; no distinctive marking. Antennae brown.

THORAX: Pronotum light brown in median area, darker laterally. Meso- and metanotum brown. Sternum brown, but paler than notum.

WINGS: Hyaline; stigmatic area whitish. Costal brace and that part of subcosta and radius enclosed by brace are brownish; venation pale.

LEGS: Fore femur dusky, tibia and tarsus somewhat lighter in color. Mid and hind legs yellowish white.

ABDOMEN: Dorsally, uniformly light brown. A pair of submedian reddish spots near anterior margin of tergites 2-8. Venter pale, unmarked.

CAUDAL FILAMENTS: Yellowish-white, unmarked.

VARIATIONS: Some females have reddish lines along posterior borders of middle tergites.

Description of Nymph (in alcohol):

MEASUREMENTS: Length of body—3.4-4.0 mm.; length of caudal filaments—1.8-2.5 mm.

HEAD: Brownish, with scattered, pale spotting. Basal antennal segments tinged with gray; a faint grayish band in outer fourth of flagellum.

THORAX: Dorsally light brown. Pronotum without special markings. A pair of longitudinal, submedian, reddish dashes on mesonotum just anterior to scutellum. Metanotum also with a pair of submedian reddish spots. Pleurae pale except for deep reddish-brown marking covering area anterior to middle and hind legs and extending from notum to sternum; these are much more extensive in male nymphs than in female, and in the latter may be considerably reduced in extent, sometimes the anterior reddish-brown area may be reduced to a spot. In some of the more strongly colored male nymphs, the areas may meet on the venter. Sternum either pale or with some reddish-brown shading, which becomes rather heavy in those specimens where pleural markings extend onto sternum.

LEGS: Pale, except for reddish-brown spot in middle of posterior face of femora.

ABDOMEN: Light brown, strongly marked with reddish brown (see fig. 8). A pair of small, submedian spots present on tergites 2-9; sometimes obscured on segment 2 and also on 6 and 7 in male nymphs. Posterior margin of 1st tergite reddish-brown; median area of tergite 2 reddish

brown. Tergites 6 and 7 in male nymphs almost entirely reddish brown, with still darker areas in middle of tergite 6; some specimens with tergite 6 pale in anterior half, or with a pair of pale triangles projecting posteriorly into reddish-brown areas. In other specimens, tergite 6 has heavy reddish-brown, median marking and lateral lines with two longitudinal pale areas separating the median and lateral markings. Female nymphs normally lack extensive reddish-brown coloration on tergites 6 and 7, but there may be a rather restricted red-brown area on tergite 6. Ventrally, there is frequently a large median dark brown spot on sternites 2-7. Sternites 1, 6 and 7 often reddish-brown, others pale. Sternite 1 nearly always reddish brown, even if 6 and 7 are pale; this is true of both sexes. If sternites 6 and 7 are colored, the median spot is obscured or absent. In some specimens, sternite 6 dark colored only on posterior border and rarely sternites 8 and 9 are dark and 6 and 7 pale. If this occurs, the same is true of the tergites and segments 8 and 9 are then completely reddish-brown. The abdominal coloring is variable, but nearly always two segments are dark colored. Gills 1-6 semi-hyaline, uncolored; gill 7 deeply tinged with red-brown in basal ⅔ (see fig. 9).

CAUDAL FILAMENTS: Stub of median filament longer than width of laterals at base. Lateral filaments yellowish-white, banded with brown at middle and outer ⅓ brown.

Holotype—male imago, in alcohol (genitalia mounted on slide). Jackson Co., Florida, Blue Springs Creek at Marianna (July 1, 1939). In collection of Museum of Comparative Zoology.

Allotype—female imago, in alcohol. Mobile Co., Alabama, 2.3 miles east of Irvington on U. S. Hwy. No. 90 (June 2, 1940).

Paratypes—3 female imagos, in alcohol. Same data as allotype. 2 females in collection of Museum of Comparative Zoology, 1 female in author's collection.

LOCALITY RECORDS: Bay Co., Fla., 16.8 miles north of Panama City (June 8, 1938, nymphs); 26 miles north of Panama City (June 8, 1938, nymphs); 27.4 miles north of St. Andrews (May 30, 1940, nymphs). Escambia Co., Bayou Marquis (June 1, 1940, nymphs). Jackson Co., 12.2 miles southeast of Marianna (July 1, 1939, adults). Okaloosa Co., 5.1 miles west of county line (June 7, 1938, nymphs; May 31, 1940, nymphs); Crestview (Dec. 12, 1937, nymphs); Niceville (June 7, 1938, nymphs). Walton Co., 7.3 miles west of Ebro (June 7, 1938, nymphs); 5.4 miles west of Washington Co. line (May 31, 1940, nymphs). Mobile Co., Alabama, 2.3 miles east of Irvington on U. S. Hwy. No. 90 (June 2, 1940, nymphs and adults).

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CUBAN LAUREL THRIPS CONTROL ON FICUS BENJAMINI

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An infestation of the Cuban laurel thrips, *Gynaikothrips uzeli* (Zimm).[1] became very severe on a *Ficus benjamini* Linn. tree growing in the Sub-Tropical Experiment Station species block. This tree, 13½ inches in diameter at six inches above ground level, was severely injured by a hurricane in 1945. As a result the principal leaders of the tree were lost, and many suckers began growing about on the large branch stubs. In view of the severe infestation conditions must have been very favorable for the thrips. These insects feed on the top leaf surfaces in a manner characteristic for the group. This causes the leaves to fold and/or to roll enclosing the thrips. Protection and favorable conditions are therefore provided for the eggs, young, and adults, living within the enveloping leaves.

Efforts to control this insect within the rolled leaves using nicotine sulphate were only partially successful, according to Professor Watson (personal correspondence). These efforts were made some years ago, and before the advent of the more recent organic insecticide developments.

It seemed worthwhile to try two new materials, DDT (1-trichloro-2, 2-bis (p-chlorophenyl) ethane) and hexachlorocyclohexane [2] (HCCH [3]) in comparison with nicotine sulphate for control of these thrips. Spray mixtures were prepared and applied with a knapsack sprayer. Different materials were put on different branches of the same tree by covering all branches

[1] Kindly determined by Professor J. R. Watson.
[2] This terminology is used although others, benzene hexachloride, "666", and gammaxane, have been employed.
[3] The letters HCCH are herewith suggested to shorten and possibly simplify the terminology of the name.

with a heavy canvas except the one being treated. After a branch leader was sprayed it was covered and another was left uncovered for treatment. The treatment materials used, in order of application, and in percentage of active ingredient, are given as follows:

Nicotine sulphate	0.125
DDT emulsion*	0.125
DDT emulsion* plus Lethane 60*	0.125 and 0.250
HCCH**	0.10
Check	—

* Furnished by Rohm & Haas Company, Philadelphia.
** Furnished by E. I. du Pont de Nemours Company, Wilmington.

Periodically after treatment the thrips on each of 10 leaves taken from branches of each of the different treatment materials were counted. The total thrips recorded on the 10 different leaves, for each count day, and for each treatment is given as follows:

No. Days After Treatment to Count	Treatment material				Check
	HCCH	DDT + Lethane 60	DDT	Nicotine Sulphate	
2	0	5	26	88	190
5	0	0	3	122	150
7	0	1	0	84	145
10	1	0	0	180	195
14	0	3	0	60	240
Totals	1	9	29	534	920

In order of fewest thrips per treatment count, the HCCH ranked first, having given almost perfect control, followed by DDT plus Lethane 60, DDT, nicotine sulphate, and check. The data suggest that the DDT plus Lethane 60 gave a quicker knockdown and kill than the DDT alone, especially over the first five days following the treatment. The nicotine sulphate count was less for each day's record than the check, and its average of control, based on totals, was 42 percent.

There was no apparent foliage injury from any treatment. A slight whitish residue remained from the HCCH; no observable residue remained from the other treatments. By 12 to 14 days after treatment new leaves had developed to the extent that thrips had infested them. Thorough treatment of the entire trees on a nearby place with DDT emulsion indicates that a reinfestation time of longer than two weeks may be expected where more complete control is obtained through treatment of all infested leaves.

Mailed July 5, 1946

"Black Leaf 40"

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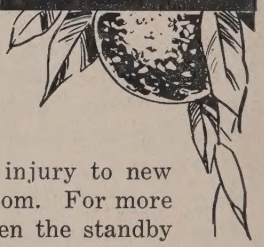

Protect the fruit and foliage from *Citrus Aphis.* Spray with "Black Leaf 40" while the foliage is young and the infestation is light. Prevent injury to new growth, especially while trees are in bloom. For more than 30 years "Black Leaf 40" has been the standby of particular growers.

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Dusting is often more convenient than spraying on vegetables. The powerful nicotine fumes are released from the dust against the various sucking insects attacking these plants.

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